

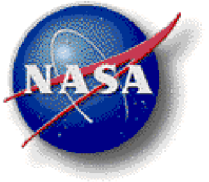


# **Performance and Safety Testing of Varta Li-ion Polymer Cells**

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Judith Jeevarajan, NASA- JSC**

**Sept. 2009**

**Judith Jeevarajan/NASA-JSC**



# Outline

- Cell Characteristics
- Performance
- Safety
- Conclusions



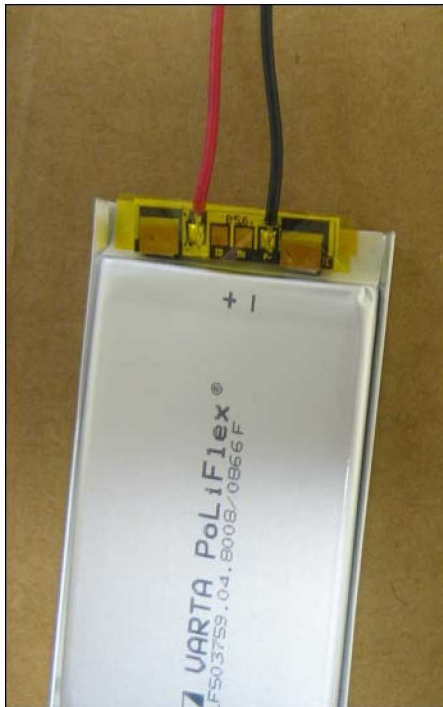
# Varta Cell Characteristics

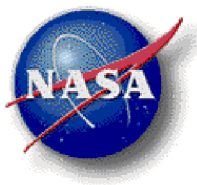
Voltage : 3.7 V

Capacity : 1.21 Ah

Dimensions : 5mm X 37mm X 38.5 mm

MOSFET switches for Overvoltage  
and Undervoltage





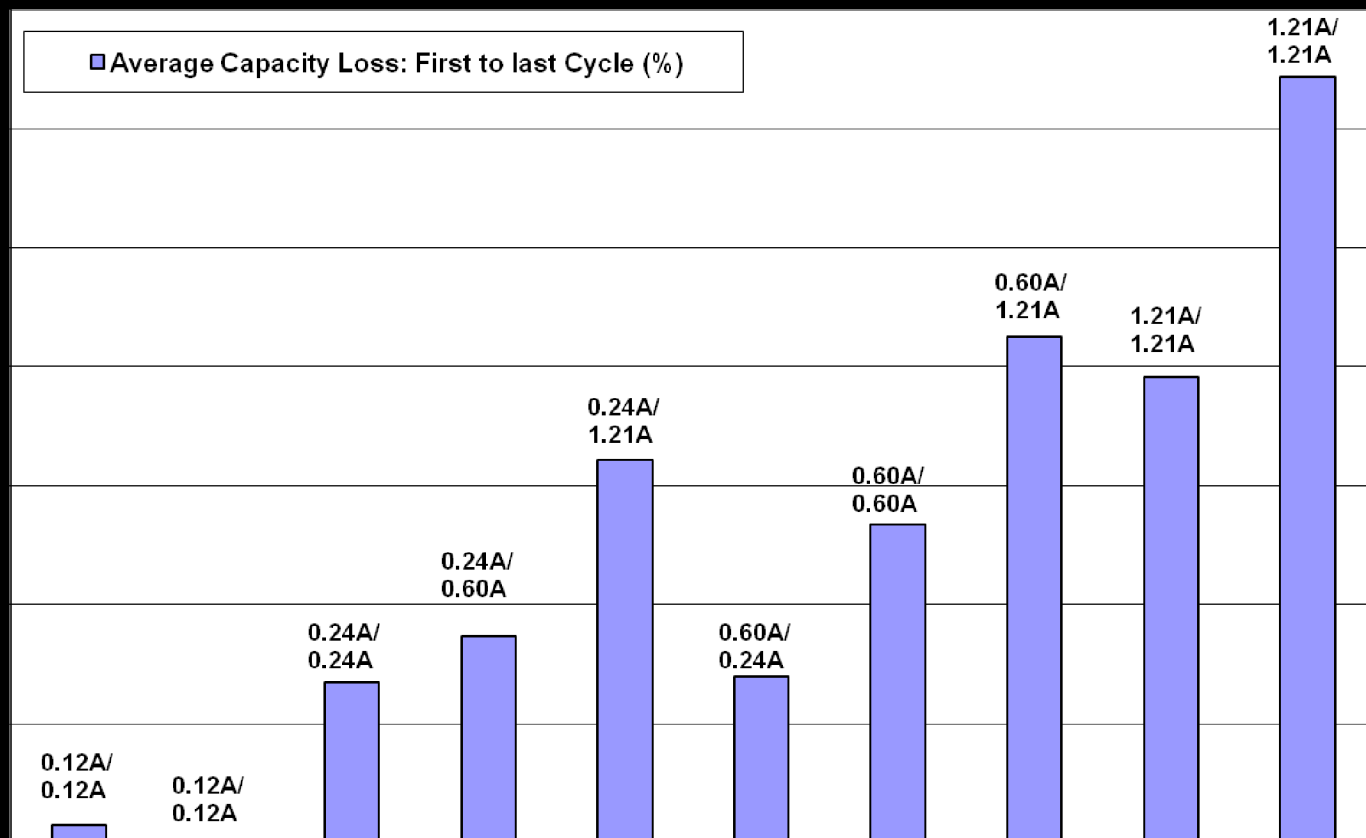
# Initial Screening Results

29 Cells delivered: Statistics on Physical Screening

	<b>Thickness (mm)</b>	<b>Weight (g)</b>	<b>OCV (V)</b>	<b>CCV (V)</b>
<b>Average</b>	5.08	22.8938	3.787	3.491
<b>Std. Dev.</b>	0.06	0.59	0.11	0.05
<b>2 x Std Dev</b>	0.11	1.19	0.22	0.10
<b>COV (%)</b>	1.10	2.59	2.87	1.49

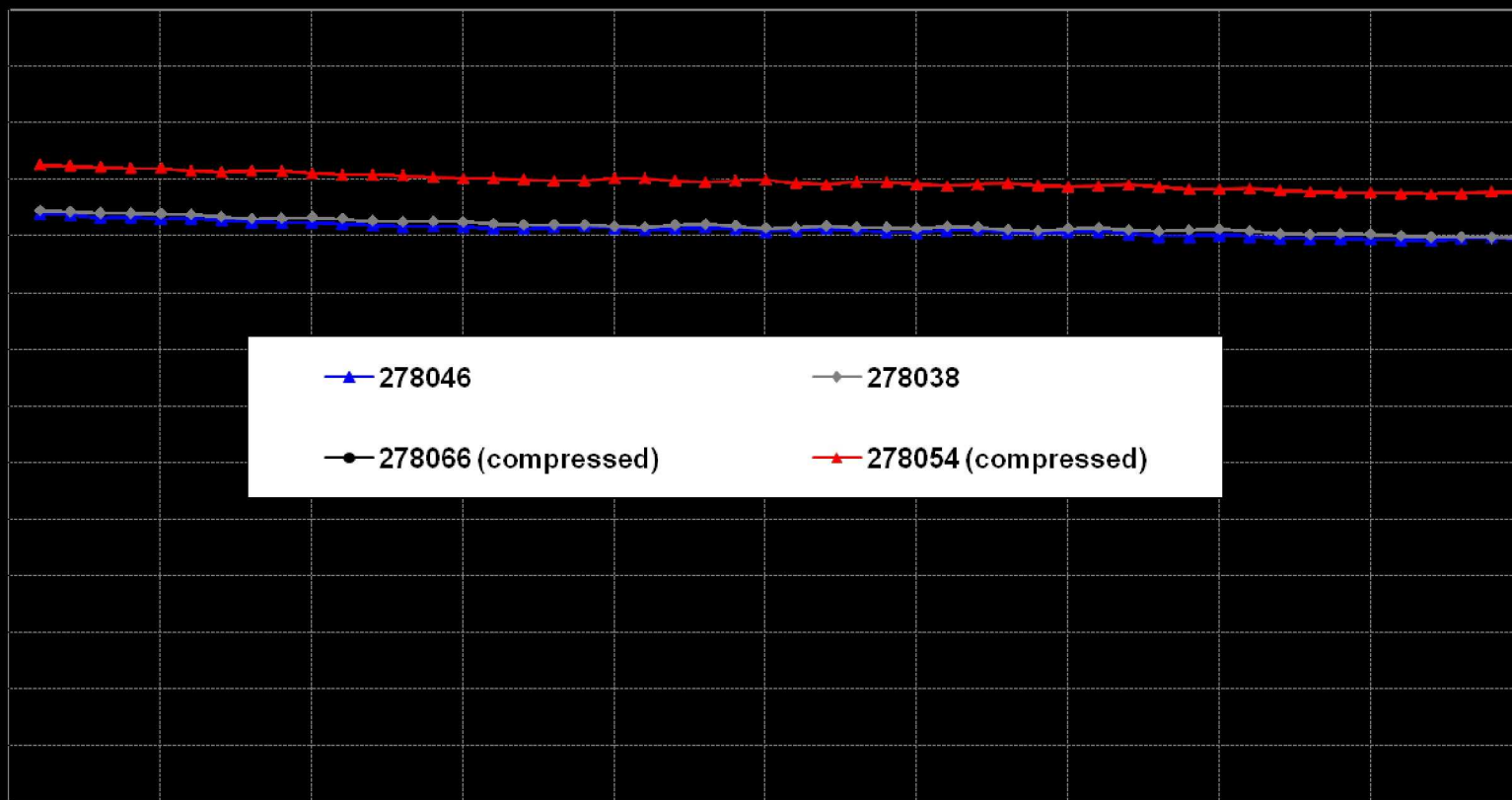


# Rate Capability Test for Varta Li-ion Polymer Cells



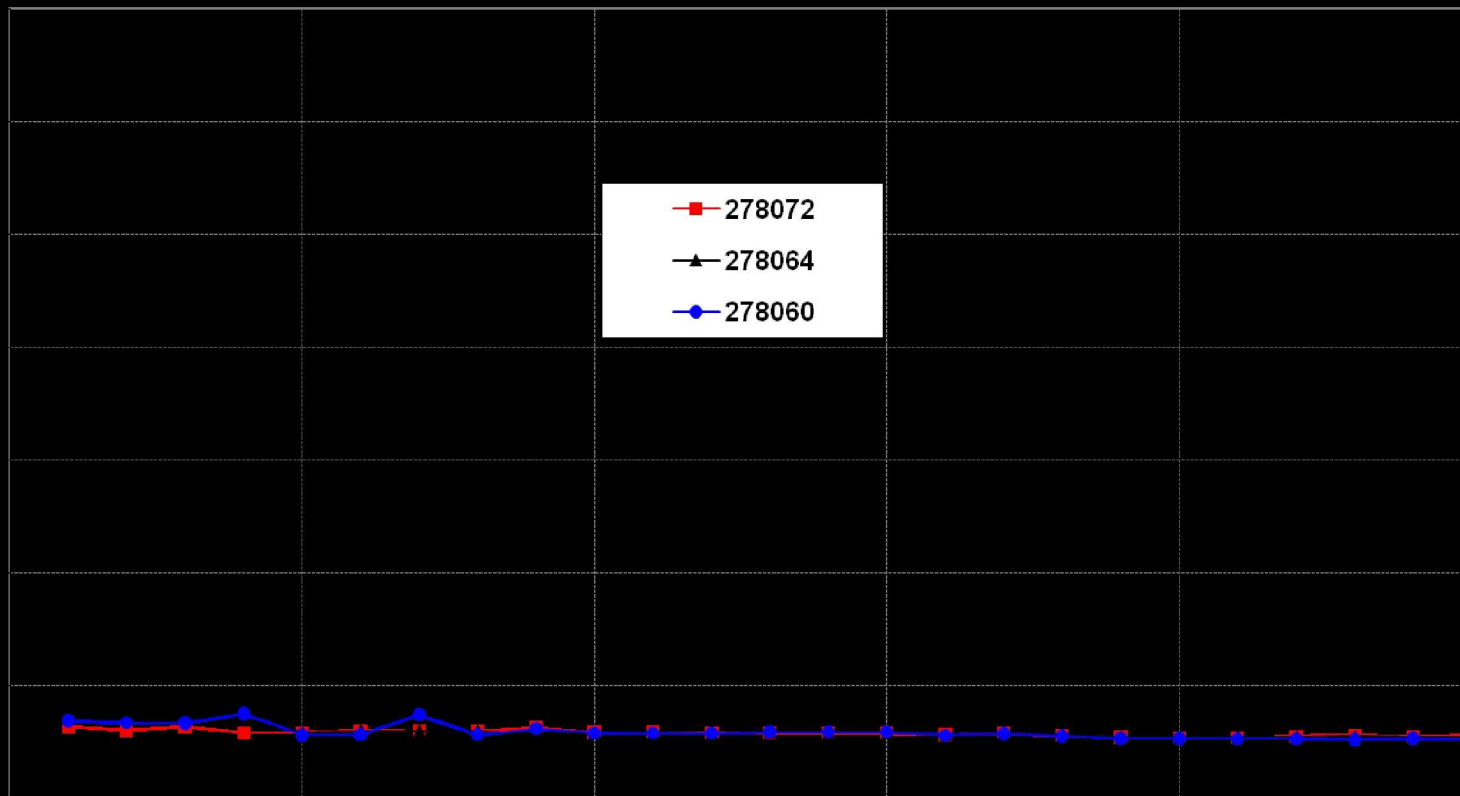


# Cycling under Vacuum Conditions for Varta Li-ion Polymer cells



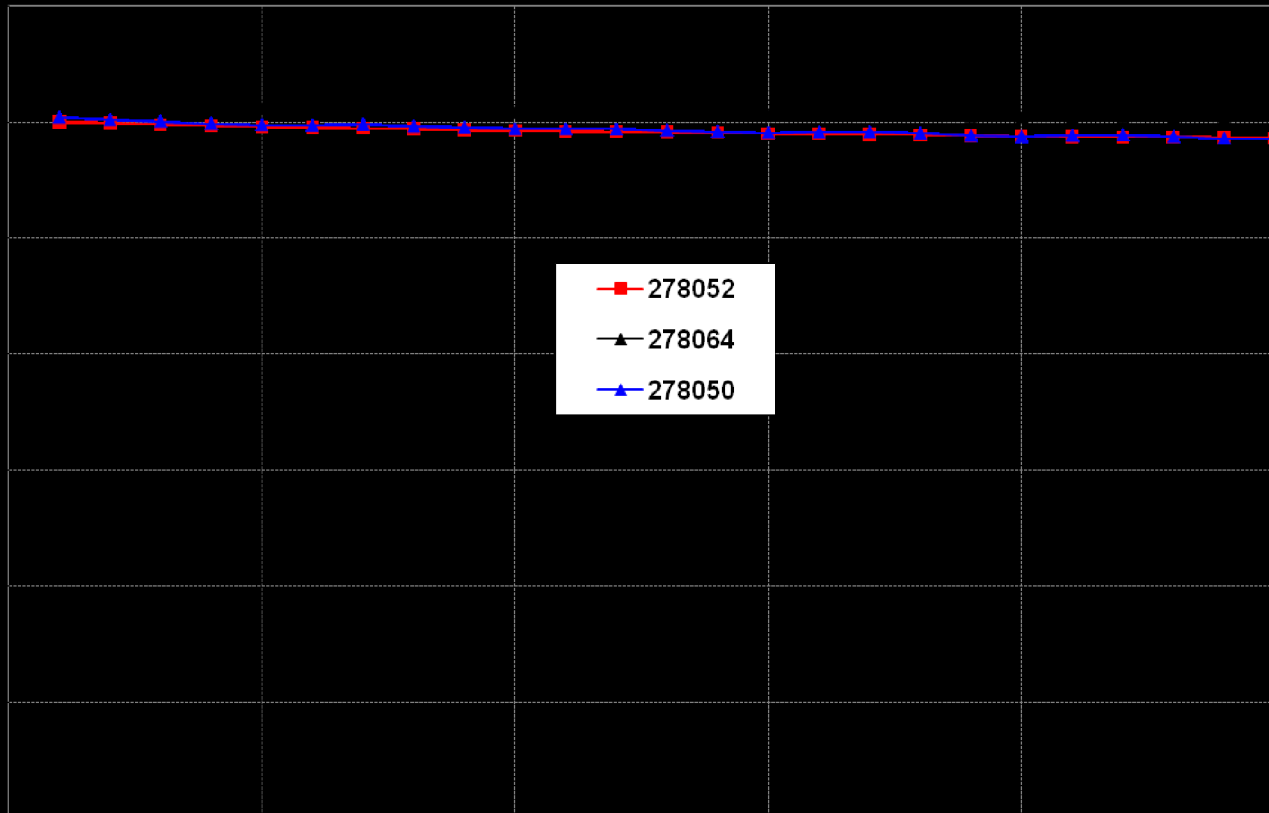


# Discharge at -20 deg C for Varta Li-ion Polymer Cells





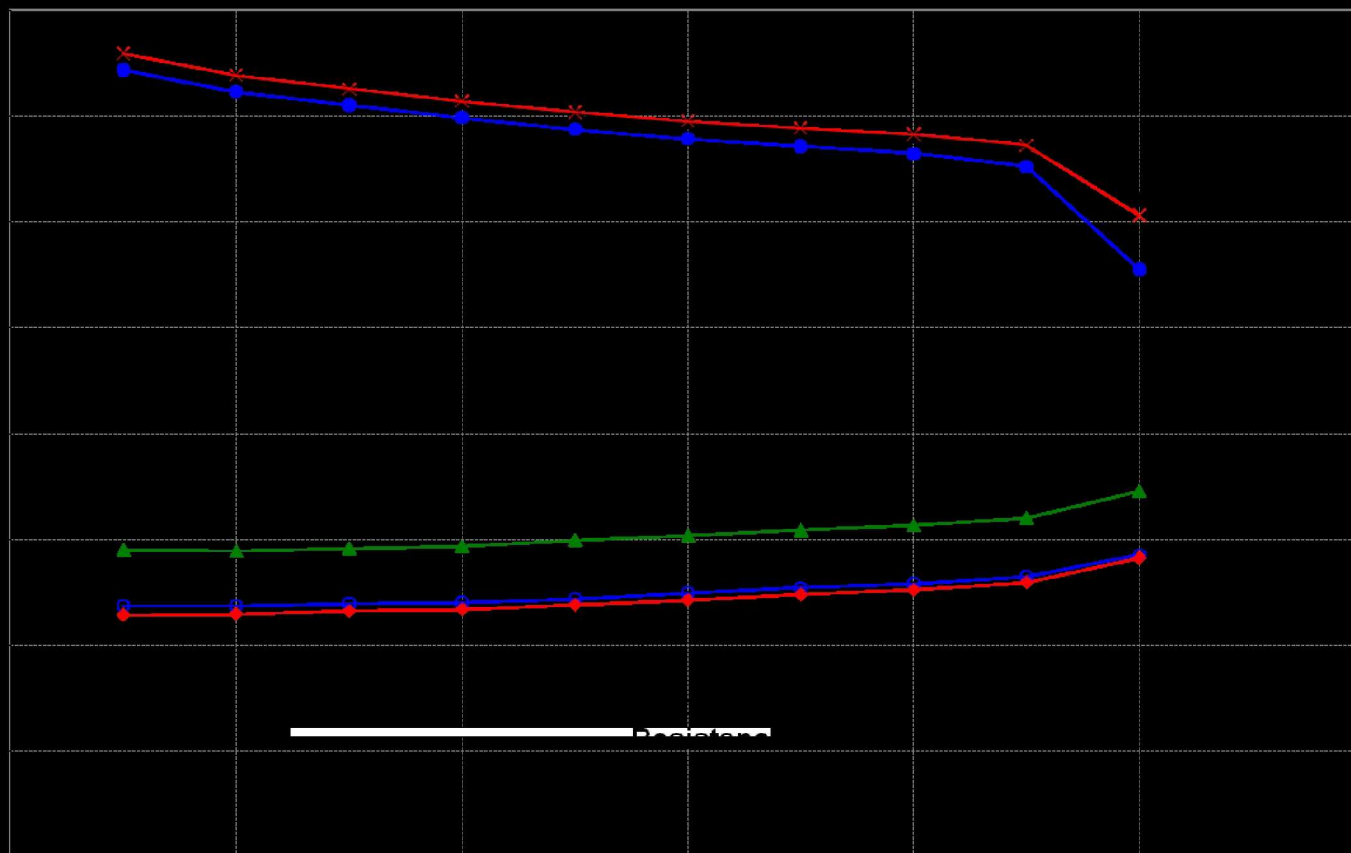
# Cycling at 22 deg C for Varta Li-ion Polymer Cell

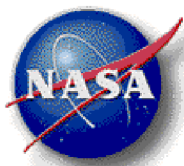




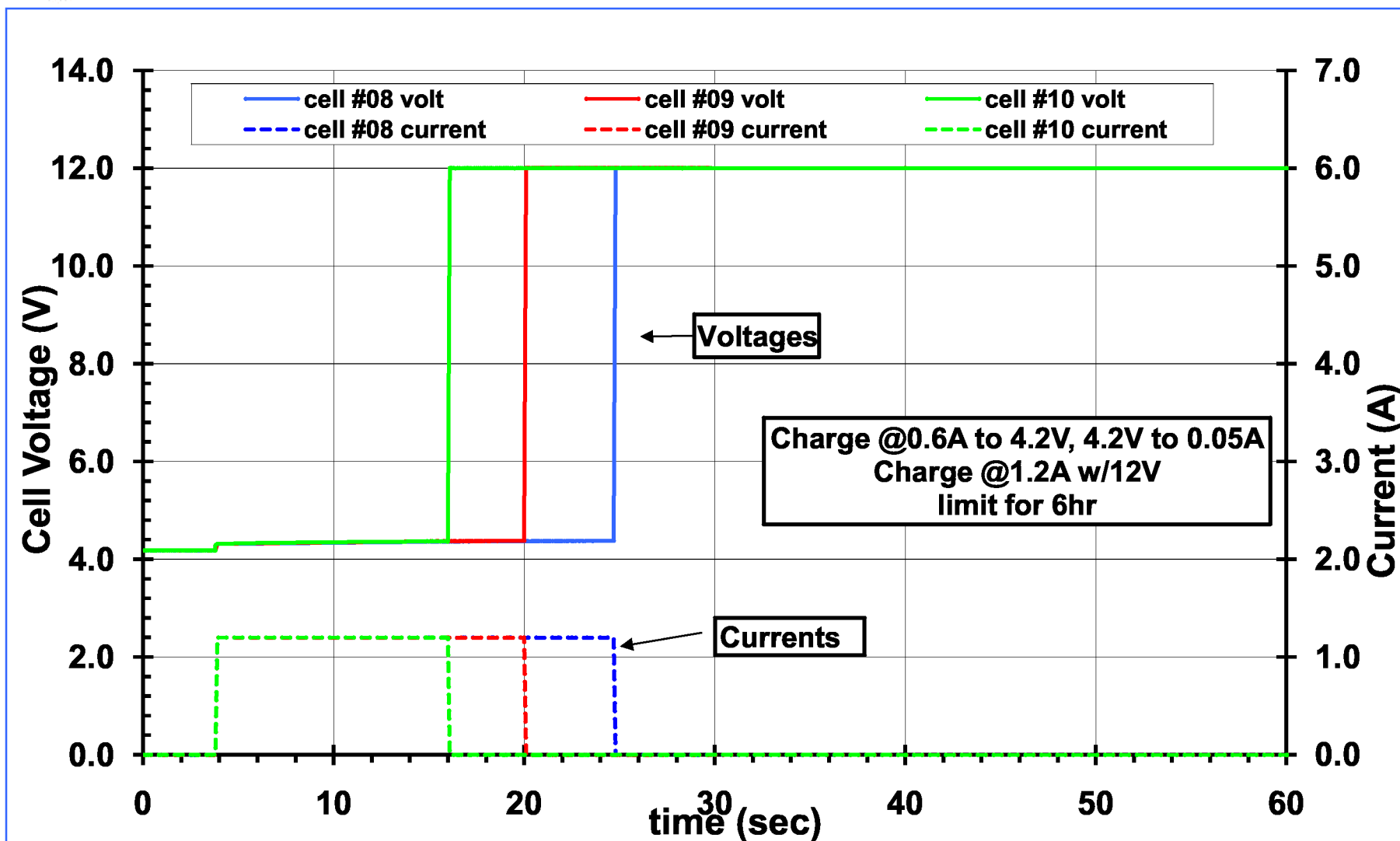


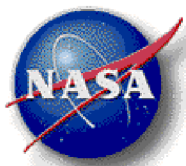
# Internal Resistance Characteristic for the Varta Li-ion Polymer Cell



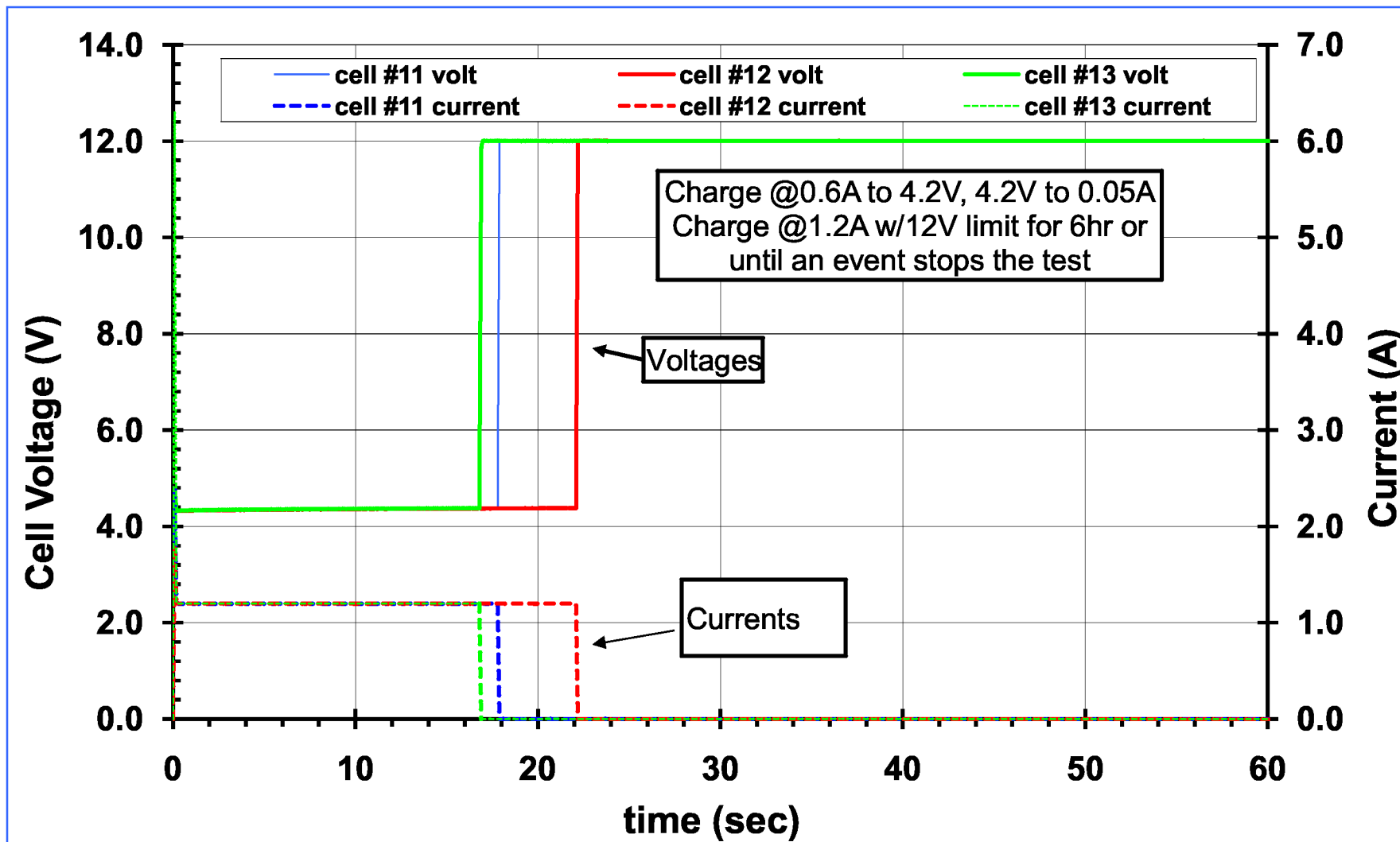


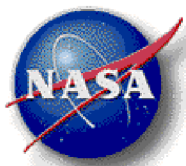
# Overcharge Test of Varta Li-ion Polymer Cell Unrestrained



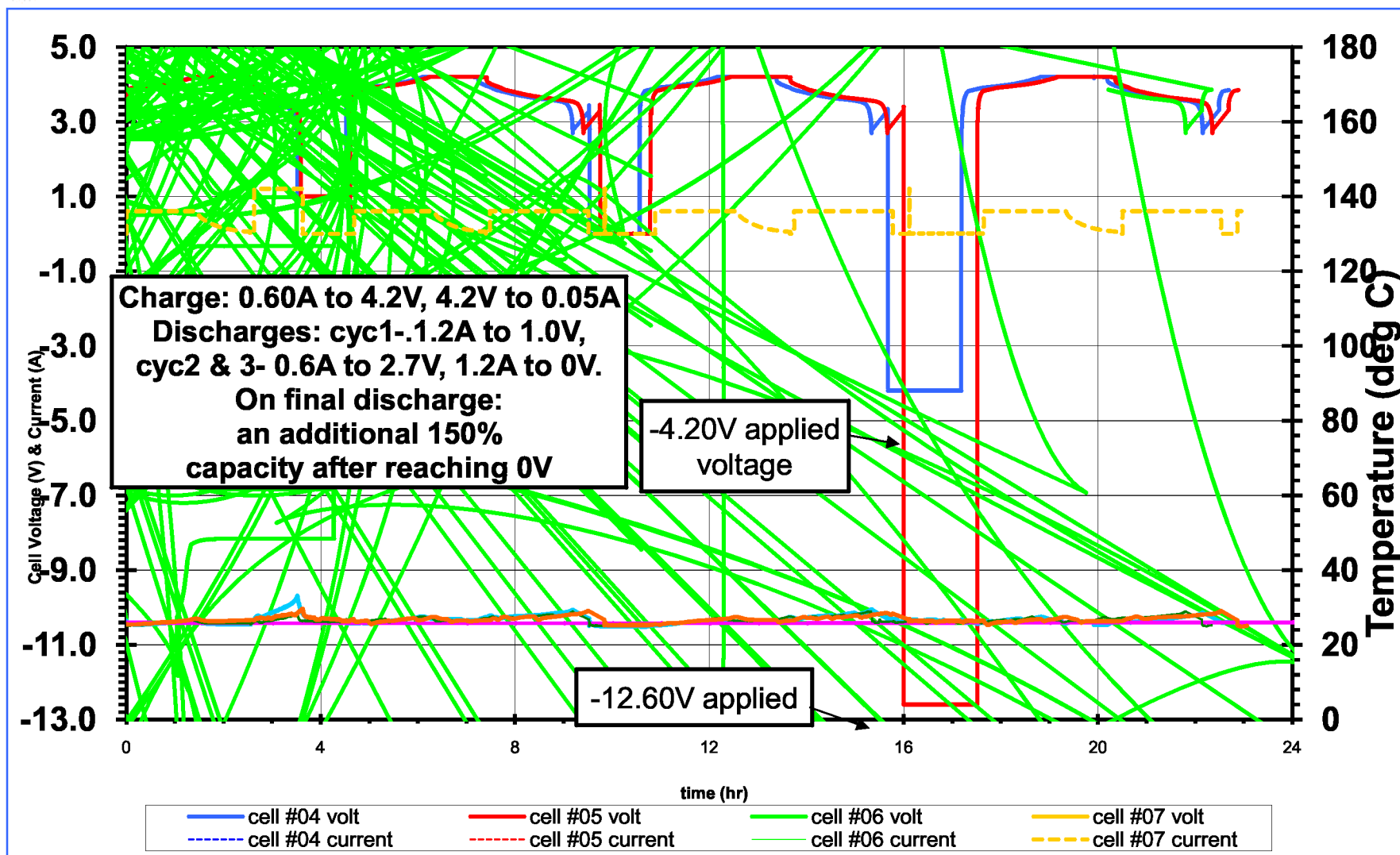


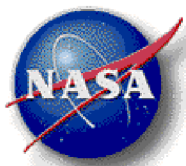
# Overcharge Test of Varta Li-ion Polymer Cells Restrained



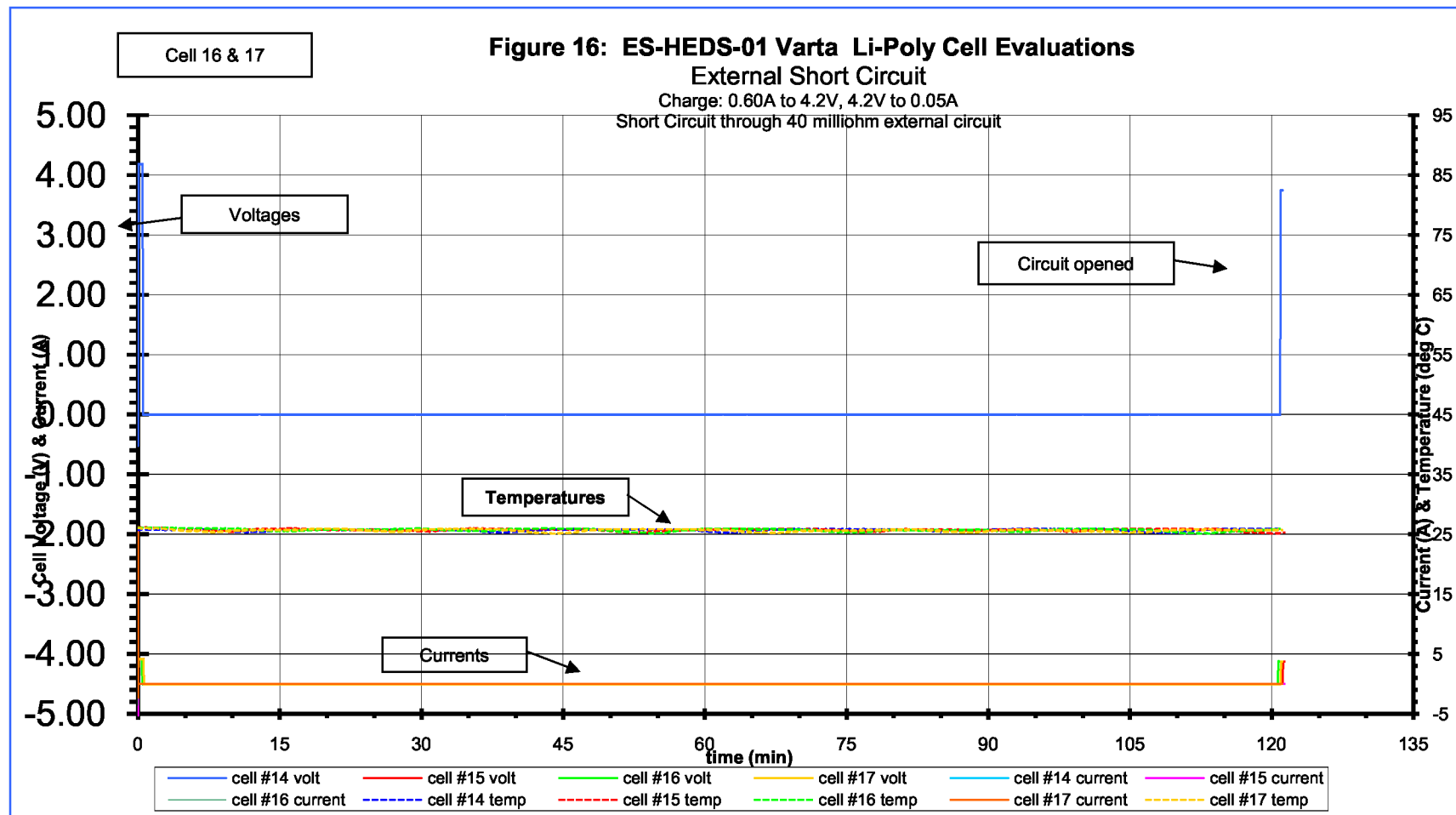


# Overdischarge of Varta Li-ion Polymer Cell Unrestrained & Restrained





# External Short Circuit on Varta Li-ion Polymer Cell : Unrestrained and Restrained





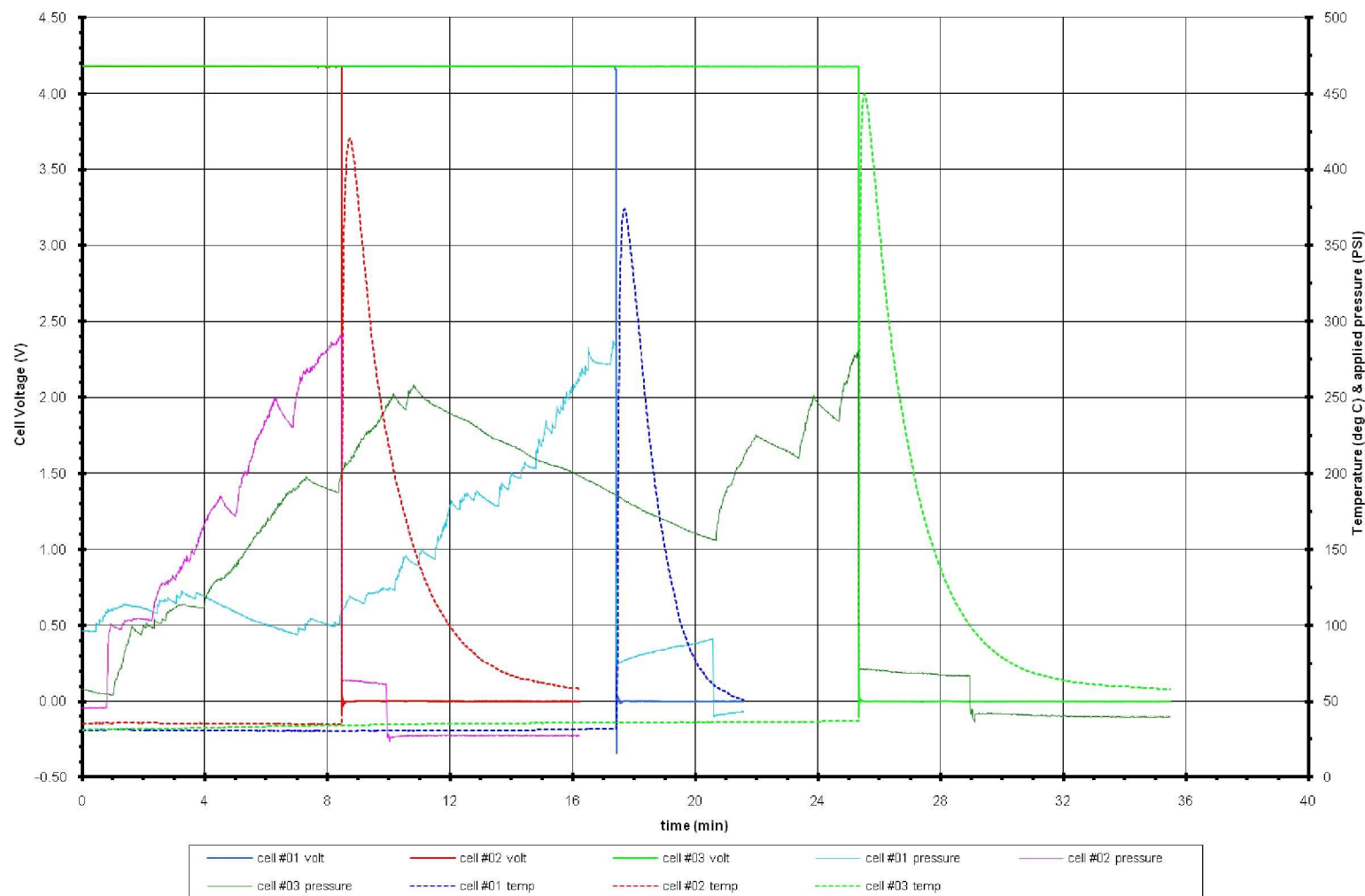
# Simulated Internal Short

Figure 20: ES-HEDS-01 Varta Li-Poly Cell Evaluations

Internal Short Circuit, Crush

Charge: 0.60A to 4.2V, 4.2V to 0.05A

Crush with a 1/4" non-conductive rod



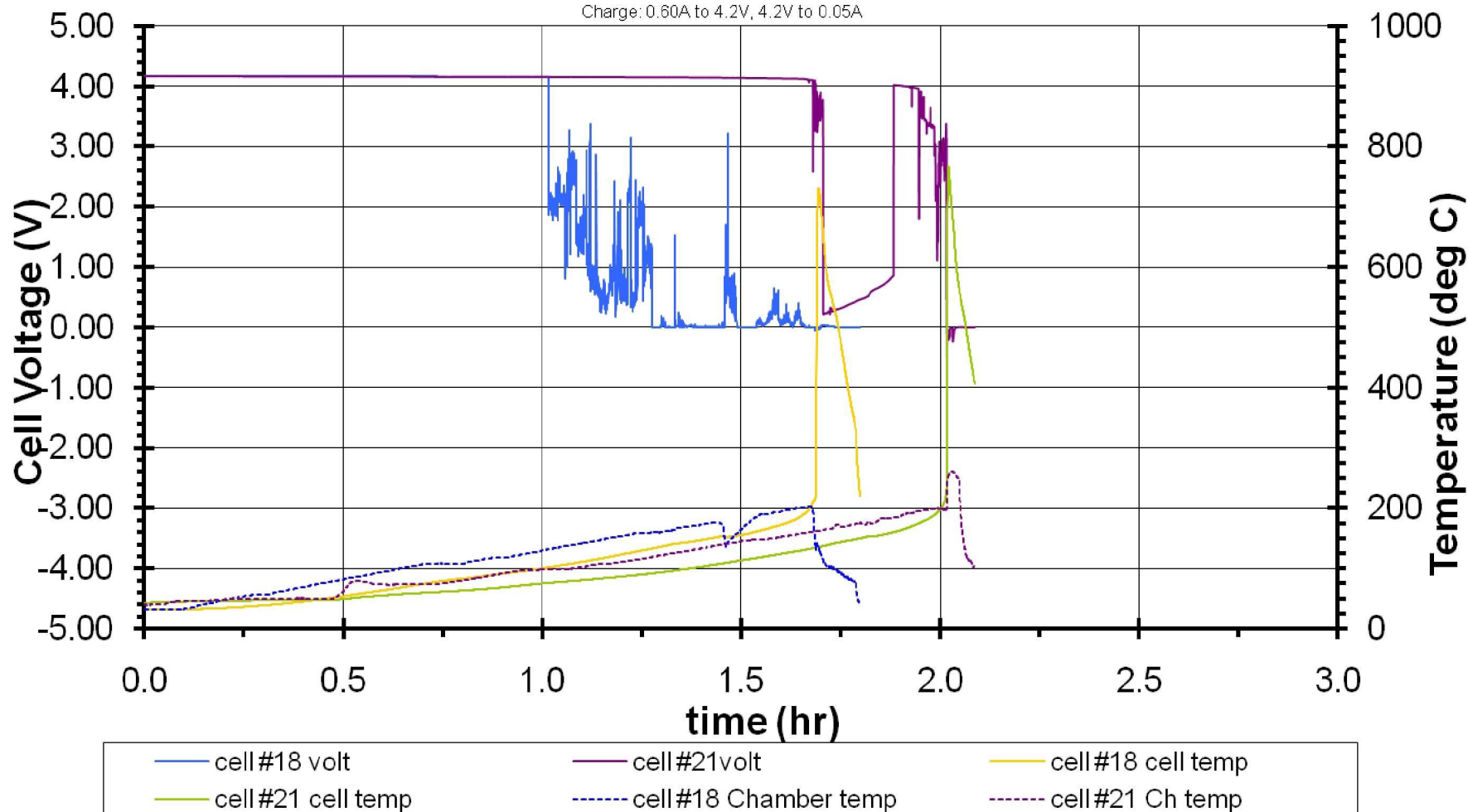


# Heat-to-Vent on Varta Li-ion Polymer Cell Unrestrained

Figure 24: ES-HEDS-01 Varta Li-Ion Cell Evaluations

Heat-to-Vent; Unrestrained cells

Charge: 0.60A to 4.2V, 4.2V to 0.05A





# Heat-to-Vent Test for Varta Li-ion Polymer Cell Restrained

Figure 25: ES-HEDS-01 Varta Li-Ion Cell Evaluations

Heat-to-Vent; Restrained cells

Charge: 0.60A to 4.2V, 4.2V to 0.05A

